DRAFT

# PATENT OFFICE LETTER

December 15, 1966

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The more sophisticated version of this view is that computers only perform algorithms, and since algorithms are mathematically formulated procedures, computer operations should not be patentable.

This is not an accurate view. Many computer programs do not resemble mathematical algorithms of the type published in Communications of the ACM (which are clearly mathematical and unpatentable). Persons whose academic background is mathematical prefer to argue that all computer procedures are "really" of this type, but the resemblance is Procrustean.

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Let me explain an example of what I would consider a computer programming technique of a patentable type: the list structure in Ivan Sutherland's

"Sketchpad" graphical drawing system.

This invention, the Gutenkrand rig list, pays proceeds to the storage of information needed to draw pictures, especially mechanical drawings or pictures made up of physical lines.

Each type of information needed for some purpose -- for instance, drawing a picture -- is stored in memory blocks. Little lines which can be placed anywhere in the computer's memory. For instance, the position of corner points to draw a rectangle could be stored in a list, or block, four items long. The user may change the picture at any time, and the machine is set up to automatically rearrange these blocks according to the changed picture. The blocks are connected together so that all the blocks having a given purpose may be found easily. This is done by pointers, which are like the address and return address on a letter. Each block carries the information on where certain other blocks are to be found. The pointers lead around in a circle, or ring, like beads on a necklace; each block calls the address of its neighbor in the "clockwise" and counterclockwise" directions. By looking at the pointers in successive blocks, the machine may "go around the ring" and perform different blocks in turn. It may also delete or insert new blocks, making the necklace longer or shorter.

One block is special. It is like the clasp on the necklace; it is a "parent" block, through which other parts of the whole

"Sketchpad" graphical drawing systems.

This invention, the Sutherland ring list, pertains to the storage of information needed to draw pictures, especially mechanical drawings or pictures made up of straight lines.

Each type of information needed for some purpose -- for instance, drawing a picture -- is stored in blocks, little lists which can be placed anywhere in the computer's memory. For instance, the positions of corner points to draw a rectangle could be stored in a list, or block, four items long. The user may change the picture at any time, and the machine is set up to automatically rearrange these blocks according to the changed picture. The blocks are connected together so that all the blocks having a given purpose may be found easily. This is done by pointers, which are like the address and return address on a letter. Each block carries the information of where certain other blocks are to be found. The pointers lead around in a circle, or ring, like beads on a necklace; each block tells the address of its neighbor in the "clockwise" and counterclockwise" directions. By looking at the pointers in successive blocks, the machine may "go around the ring" and service different blocks in turn. It may also delete or insert new blocks, making the necklace longer or shorter.

One block is special. It is like the clasp on the necklace; it is a "parent" block, through which other parts of the whole

computed program find and make reference to the parts of this list. (In Sutherland's parlance, this is then "hen" and the other blocks are the "chicks.")

This invention is both very simple and very important.

I would like to make several points about this. The most important is that Sutherland's ring structure is not mathematical, although it can be mathematically expressed. It is a process or art for the handling of information which is unique to the world of digital computation. It is the sort of brilliant contribution to the world which will be kept under wraps if it is discovered within a company; the publicity of a patent, and subsequent licensing, would make it possible for such techniques to be used instead of secretly hoarded, as they are now.

The techniques of list processing, like Sutherland's, are only one area in which inventions occur that are uniquely in the area of digital ~~computing~~ computing, and neither fish, fowl nor mathematics by any prior criteria. Other important areas where such inventions occur include compiler programming, graphical display (the original use of Sutherland's system), time-sharing and many ~~xx~~ others.

Since I think it is self-evident that inventions like ~~Sutherland~~ Sutherland's constitute ~~xx~~ patentable inventions in the legal sense, I have tried to figure out what distinctions exist between this type of process and the others.

I have thought of several possible distinctions for this purpose. Let me summarize them for your evaluation. The intent is to distinguish such procedures from mechanical procedures, on the one hand and ordinary bookkeeping procedures, on the other.

Distinction 1. A finer process or technique should not be patentable if it is primarily employed in connection with is ordinarily evaluated in mathematical terms; for example, where a thing being evaluated is usually regarded as a mathematical entity itself, or usually regarded as a partial product in some other system. (For example, "square root" and "standard deviation," but not Euclid's here and nor cubics.)

Distinction 2. A process or technique should not be patentable if it is primarily employed of numerical mathematical evaluations as used in customary accounting or numerical procedures; especially, if the use extends it to be a set of numbers rather than some final product (such as a mere map).

Distinction 3. An invention should not be patentable if it is covered with claims withdrawal protection of any kind is customary. This would eliminate restrictive, extremely and optics, but favor electro-coding, like processing and so on.

Distinction 4. A program should be patentable if it may be divided up into conceivable parts that have some important special meaning, or may mathematical relation, one use an important special meaning, or may

I have thought of several possible distinctions for this purpose. Let me enumerate these for your evaluation. The intent is to distinguish such processes from mathematical procedures, on the one hand and ordinary bookkeeping procedures, on the other.

Distinction 1. A process or technique should not be patentable if its purpose is to ascertain something which is ordinarily evaluated in mathematical terms; for example, where a thing being evaluated is usually regarded as a mathematical entity itself, or usually regarded as a partial product in some other system. (For example, "square root" and "standard deviation," but not Sutherland's hens and chicks.)

Distinction 2. A process or technique should not be patentable if it is principally composed of numerical evaluations as used in customary accounting or numerical procedures; especially, if the outcome is to be a set of numbers rather than some final product (such as a map).

Distinction 3. An invention should not be patentable if it is concerned with areas where mathematical notation of any kind is customary. This would disallow statistics, astronomy and optics, but favor picture-making, list processing and so on.

Distinction 4. A program should be patentable if it may be divided up into constituent parts that have some important spatial relation, has some important spatial analogy, or may

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be drawn on paper as a set of components in space, etc. If, like a tangible machine, a computer program has parts which may be thought of as existing or moving in space, we are not dealing with a process so much as a machine which has been abstracted. (I understand this to be the intent of the "functional block" criterion in the Patent Office's guidelines.)

This distinction would go some way, I think, toward allowing such systems as Sutherland's file structure.

Scene Twentyeight. AAARRRGGHHHHHHH!

(The bedroom of the IBN KHAN. IBBY and WAZIR are seated.)
IBBY. So Shamavil says his coalition will support my policy?
WAZIR. He is certain. He is certain also that you will win popular support, particularly through your education and health programs.
IBBY. Fine. There remains the problem of visits to me from secret agents, if any. I don't think it's very likely.
WAZIR. Perhaps not! Well, your highness, I shall return to the hotel. I am tired from all this politicking, and the exotic American food gives me indigestion.
IBBY. Good night, Mohammed. See you in the morning. (Exit.) (Exit WAZIR, that is.)
(Knock at door.)
IBBY. Come in.
(SOVSPY enters.)
SOVSPY. Good evening, your highness.
IBBY. Good evening.
SOVSPY. It's taken me quite a while to find you.
IBBY. Oh?
SOVSPY. Can we be overheard?
IBBY. I don't think so.
SOVSPY. I am here on special business.
IBBY. I think I know who you are.
SOVSPY. Do you wish me to introduce myself?
IBBY. Please do.
SOVSPY. I am placing my life in your hands. (Bows.) Aram Zdarovii, representing the Union of Soviet Socialist Republics.
IBBY. Oh, you Communists are all alike. You don't have to talk to me, I've heard it all before. Dialectical Materialism, Marx, Lenin--
SOVSPY. I'm afraid you've got me wrong, Your Highness. That stuff is for the children. I see I can talk to you man-to-man.
IBBY. What is this? No political propaganda?
SOVSPY. None at all. Just facts; hard, solid facts. Listen. You are leader of the Rhamadites, Mogul of Tocharistan and owner of the richest oil fields and fastest pipeline in the world. Never mind the propaganda-- you have power and I have power. With my help you can rule the Middle East!
IBBY. I have in mind the good of my people.
SOVSPY. Oh, come now.
IBBY. Does it seem strange?
SOVSPY. Let's talk hard facts. Your country is in a central location. You are in power. If you went to get more power, it will be quite, quite simple.
IBBY. Oh? Tell me about it.
SOVSPY. Let's put it this way. Nasser doesn't know if he can count on you as an ally. First you convince him that you are his ally, and then-- poof! Declare war on him, and show conspicuously that you're willing to use the tactical A-bombs we give you. You can step right in! Of course, with a little help from our junta in the Egyptian Army.
IBBY. I see. What then?
SOVSPY. Next it's Saudi Arabia. We control the secret police there. Our agents can foment a little uprising in honor of your taking Egypt, and some fast footwork will net you a coup d'etat.
IBBY. What about the Rabuf of Fubar?
SOVSPY. He trusts you, and I think a gift of a couple of Cadillacs would make him very helpful.
IBBY. What about the Imam of Oman?
SOVSPY. Three Cadillacs there. Maybe a Rolls-Royce.

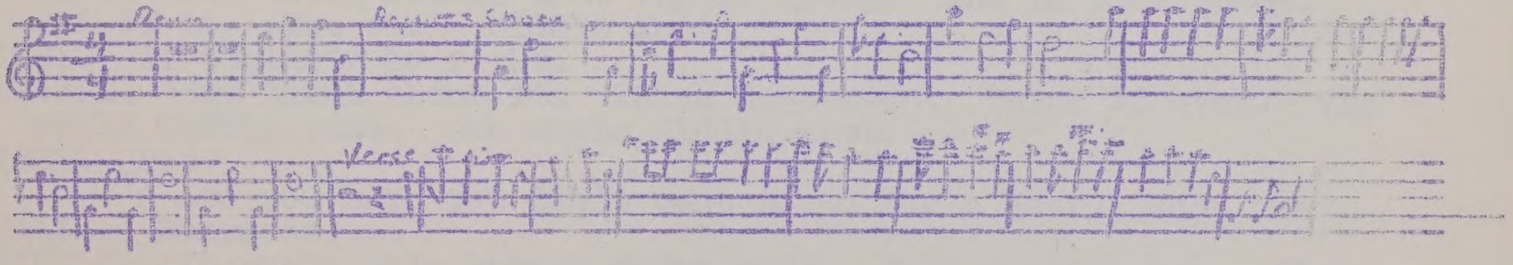
IBBY. What about the Mufti of Iftum?
SOVSPY. A Mercedes and a bicycle.
IBBY. And so the Middle East is in my pocket, huh?
SOVSPY. That's right. Think it over.
IBBY. I will indeed.
SOVSPY. My life is in your hands.
IBBY. Don't worry about that. For the present, at least.
(SOVSPY enters. IBBY lights a cigarette. Knock at door.)
IBBY. Come in.
(Enter
BOHEMIAN TYPE COLLEGE STUDENT, whom we have not seen before. He wears dungarees, a sweatshirt, and a bandana around his throat. He is unobtrusively carrying a guitar.)
IBBY. Good evening.
STUDENT. Good evening. (Pause.) I suppose you know who I am.
IBBY. Oh, let's get on with it.
STUDENT. I'm from the CIA. You can call me Wilbur.
(Outside the left-open door, 1 FRATMAN and 2 FRATMAN have overheard this interchange.)
1 FRATMAN. Hey, that boho in there says he's from the CIA. What the hell's that?
2 FRATMAN. Must be some new anti-fraternity club. It'll never get off the ground.
(They fiddle away.)
STUDENT. (closing the door.) I just wanted to assure you that the American government places confidence and trust in you. We know what you're like and where you stand. You're our friend, and we are yours.
IBBY (amiably.) Fine, fine, fine.
STUDENT. The forces of totalitarianism, oligarchy, atheist Marxist-Leninism and central planning steal across the world like sinister shadows, awaiting chinks in the armor of freedom; and under the false banners of "free speech," "democracy," "civil rights", they foment discontent with the freedom we now have. Our only defense...
IBBY. Have you been the campus?
STUDENT. Why, yes... Er... I presume you've been visited by agents of er... other powers...
IBBY. Maybe yes, maybe no. (Showing him the door.)
STUDENT. Feel free to call upon us at any time.
IBBY. Just one thing. How did you find out who I was?

STUDENT. Easy. I looked in the Freshman directory. They don't call me Wilbur for nothing.
(Blackout. Sighs of relief.)

Scene Twentynine-A. Interlogue.
(The organ pit is illuminated, and suddenly looks like the control room of the campus radio station. DAVID HORR and ELLIE SCHUKER are at the controls.)
DAVID. And now, station WRSN brings you a recorded speech by the president of our college.
(THE COLLEGE PRESIDENT begins his speech once more, from somewhere in the dark. DAVID presses some buttons, then gets up and stretches.)
DAVID. Say, did you hear any of that strange story about drugged coffee?
ELLIE. You mean about how they always put saltpeter in the coffee on weekends?
DAVID. No, this was something different.
(Lights snap off in the pit, on onstage.)

Scene Twentynine. Slyness Trouble.

(The Snack Bar. SAM PICKLE and ELLIE WHELK are at a table.)
PICKLE. So you're sure you don't want to go to Sandy's bar?
ELLIE. Under no circumstances. I've got to write a paper tonight.
PICKLE. Papers we have always with us. Good beer is hard to get.
ELLIE. Sorry.
(IBBY and SOVSPY come in.)
IBBY. So you still want to talk to me, eh?
SOVSPY. Yes. Don't take me for a fool. If I had nothing to offer, I would not waste your time and my own.
(They sit.)
IBBY. Very well. Shall we get down to business?
SOVSPY. Well, let's make this interview as gracious as circumstances will permit. Would you like anything? A hamburger? Coffee?
IBBY. I'll have coffee.
SOVSPY. Very well. I'll join you. (Goes to snack bar.)
PICKLE. So you definitely don't want to go out tonight?
ELLIE. I must write a paper. If I sit here and get more and more bored, I'll eventually do it. If I go out with you it wouldn't be boring enough.
PICKLE (smugly.) True, true. Well, can I get you anything?
ELLIE. Coffee.
PICKLE. Right-o.
SOVGIRL (to SOVSPY, at counter.) This drug will make him more -- susceptible to your arguments.
SOVSPY. Will he taste it?
SOVGIRL. He won't have the slightest idea.
SOVSPY. Fine.
PICKLE. Two coffees, please.
OTHER COUNTER GIRL. Cream?
PICKLE. Cream?
ELLIE. Yes.
PICKLE. Yes.
SOVSPYxGIRL. Cream?
SOVSPY. Cream?
IBBY. No, thanks.
SOVSPY. No.
(With complete irrelevance, HERBERT MARLIN goes past.)
ELLIE. Hey, Herbert, have you got a cigarette?
HERBERT. Sure. (Gets out Chesterfields.) You like your pleasure big?
ELLIE. Well, that depends.
(SONG: "Like Your Pleasure Big?")



CHORUS:
Do you like your pleasure big?
If so, you like your pleasure big,
If so, why not?
If so, you like your pleasure big,
If so, you like your pleasure big,
If so, why not?

Down in Jamaica they all say
The pleasure need not be of very short duration
With care you may continue all the day

BRIDGE:

As the pleasure gets bigger
No sorrow will linger
All troubles go home
With snap (sic) of the finger...

Jamaica girl once say to me
You like your pleasure big, sir?
When I said I felt differently
She gave to me this answer:
CHORUS
Back home down Jamaica way
My donkey* like to dance and bray
But up here in the U.S.A.
My donkey can only say:
CHORUS

ELLIE. Now could I have a light?
HERBERT. Yeah, sure. (Gives it to her, exits.)
(At the counter: confusion over coffee. PICKLE takes two cups, so does SOVSPY.)
SOVSPY. Hey, did you say you wanted cream in your coffee?
IBBY. No.
SOVSPY. Oops. (Moment of profound worry.) Just a minute.
(Crosses with IBBY's cup.)
SOVSPY. Say, I think I got the coffee mixed up. Was yours with cream?
ELLIE. Yes. It should be.
SOVSPY. Ah. Here. (Exchanges the cups.)
PICKLE. What is your paper on?
ELLIE. "Some aspect of philosophy."
PICKLE. That's difficult. Have you chosen an aspect?
ELLIE. Danish pastry and the free-will problem.
PICKLE. I don't understand.
ELLIE. Well, you see, with Danish pastry you have a lot of choices, but outside factors probably influence you.
PICKLE. Boy, they really have got it down to a fine point, haven't they?
SOVSPY. How's your coffee?
IBBY. Well, about like usual. Now, what more do you want to discuss?
SOVSPY. Well, I don't think you're really being fair about the whole thing. With a twist of the wrist you could become Master of the Middle East. (Slowly, suggestively.) Now, wouldn't you like that? The whole Middle East in your grasp. Hm In your grasp. All of it. The whole Middle East.
IBBY. It wouldn't be right.
SOVSPY. But think about it. Think de-e-e-ep. Think it over. The whole Middle East. The whole Middle East.
IBBY. So?
PICKLE. Are you sure you don't want to go for a beer? Just one?
ELLIE. Beeeeer....
PICKLE. It would only take a short time. Just a quick one. Nice, cool beer.
ELLIE. Nice, cool beer. Yes.
IBBY. You're wasting my time. I have an examination tomorrow.
SOVSPY. But think of the power within your grasp. Power. POWWWWer.
IBBY. Look, this is irritating.
PICKLE. Then we could go for a nice long walk. It's a lovely evening.
ELLIE. Walk. Evening. Lovely. Lovely.
PICKLE. Well, shall we go? Just a quick one.

* Cf. Calypso songs in general.

ELLIE. A quick one. Yes. (Rises somnolently.)
IBBY. Hey, Ellie! Have you done your paper yet?
ELLIE (turning and floating the other way) Paper.....
PICKLE. What he means is, let's go for a walk.
ELLIE. Paper... must do... paper...
PICKLE. Hey. I know where there's lots of paper.
IBBY. Are you going to have it in tomorrow?
PICKLE. Sooner than that.
ELLIE. Paper... must do paper...
PICKLE. Hey! Wait! (They exit.)
IBBY. Now look here. There's no way you're going to persuade me to do anything. However, I have a bargain to make with you. I've about reached the end of my patience. I know this ideology business isn't going to influence you, so let's put it in practical terms. Either leave me alone, or I'll turn you over to the authorities.
SOVSPY. I have my pride. I refuse.
IBBY. But think it over. Think of all the valuable secrets you know. Think of being able to get a pardon in return for all the secrets.
SOVSPY. But they don't call me the Turtle for nothing...?
IBBY. Like some more coffee? It's my turn now.
SOVSPY. Okay.
(CITIES is at the counter, conferring with CITIES GIRL.)
CITIES GIRL. This will fix him. It'll make him very suggestible to whatever you offer.
CITIES. Okay.
IBBY. Two coffees, please.
CITIES GIRL. Right. (Winks at CITIES.)
CITIES. Well, Ibby, I'm glad to get a chance to talk with you. You know, I've been thinking about the situation in the Middle East, and it seems to me that unless the oil is properly drilled and refined, all the natural resources out there are just going to go to pot. Now, there are some oil companies that just happen to have the equipment and manpower. Oh, let me pay for the coffee. (Does.)
IBBY. Just a minute, I have to talk to this guy first. (To SOVSPY.) Now, then, let's put it this way. If you were to voluntarily turn yourself over to the American authorities, you'd probably pick up a nice piece of change for the information you could give them. And after that you could write articles about what it was like, and so forth. Think of the book rights! Think of the motion picture royalties!
SOVSPY. Royalties.
IBBY. Think of all the money you could make! Prestige, power, fancy cars. Think of the movie they'll make of your life story.
SOVSPY. Life story...
IBBY. Think about over.
SOVSPY. Over...
IBBY. Let me know what you decide. Leave the answer in a conspicuous place.
SOVSPY. Conspicuous place...
IBBY. Now what can I do for you? (As CITIES approaches.)
CITIES. Well, as I was saying, about drilling rights, I happen to know the man who runs the foreign branch of the Cities Service petroleum company, and if anyone in the Middle East with Oil Rights came to him, he'd be able...
(SOCONY and SOCONADE are at the counter.)
SOCONY. You say it will make him suggestible?
SOCONADE. He'll agree to anything.
SOCONY. What does it taste like?
SOCONADE. No taste at all.
SOCONY. All right, then. Hi, Ibby! Can I get you some coffee?

IBBY (To CITIES.) Want coffee?
CITIES. I guess so.
IBBY (to SOCONY.) Sure.
(SOCONY takes the coffee; & SOCONY takes it from her, and carries it to the table where SOVSPY sits mumbling, CITIES sits eagerly and IBBY sits.)
SOCONY. You know, Ibby, a fellow was talking to me just the other day about drilling for oil in the Middle East.
IBBY. Well, you and this guy should get together. That seems to be his line too. Here's your coffee. (Passes it to CITIES.)
CITIES. Yeah, well, it just seemed to me that if anybody had rights in the Middle East and no capital equipment to drill it with, he ought to bring in an American company.
SOCONY. Say, you're right. Now, it just so happens that I know a guy down at Socony-Vacuum...
CITIES. Socony-Vacuum! They're a bunch of bums! They'll cyp you out of everything! Now, Cities Service..
SOCONY. Cities Service! Are you crazy? Socony Vacuum has eighty-ton portable pneumatic rigs, and all Cities Service has is those crummy old twenty-three-gauge two-prong jobs. Now, with an eighty ton...
CITIES. What's wrong with them twenty-three-gauge two-prong? It's seen all the best oil fields-- the Gulf, Texas, Brazil-- it'll stand up anywhere!
SOCONY. You're crazy! The 80 pneumatic has it all over the 23gauge twoprong. The 80 pneumatic...
CITIES. Eighty pneumatic...
SOCONY. Is the best ever designed. It's portable, light...
CITIES. Portable.
SOCONY. Resilient, takes direct current... (IBBY leaves...)
CITIES. Direct current...

BLACKOUT

Scene Thirty. Putting the Heart before the Course.

(The library. CLINT LOGAN is studying. SUE HILLOWAY enters.)
SUE. Hi. (Pause.) Do you mind being been with?
CLINT. No. But I have to study. Honors exams coming up.
SUE. Well, I'm in the same fix. You know, at a time like this you sort of need companionship.
(Pause)
CLINT. Gee. Yeah. As a matter of fact you're right.
SUE. Yeah.
CLINT. Well, we'd better study.
SUE. Yeah, I guess so. You know, there's something funny in the air tonight.
CLINT. There is?
SUE. Don't you feel it?
CLINT. No.
SUE. Try.
CLINT. I'm feeling as hard as I can.

SUE. Well, it's There.
CLINT. Well, we'd better study.
SUE. Yeah.

(They study. Then they sing "I Just Feel like Bein' in Love," reading the appropriate quotations to each other.)
SUE. According to Freud, the child's libidinal attachment to his opposite parent is directly accountable for the role-relationship accepted in adulthood.
BOTH. (This is the SONG: "I Just Feel...")
Everywhere, between the sexes,
The seat of cathexis is the solar plexus!

CHORUS. I just feel like bein' in love,
Anything will do;
A doorknob or the stars above
Or maybe even you....

(MUSIC on p. 51)

CLINT. According to David Hume, it is impossible to establish the principle of causality except as a mere euphemism for temporal wequence.

Never mind the causal nexus,
The seat of cathexis is the solar plexus!
I just feel like bein' in love,
Anything will do;
A molehill or a satin glove
Or maybe even you.

SUE. Krafft-Ebing mentions the case of Desdemona H. and Alexis W.-- who were very fond of each other.

For Desdemona and Alexis
The seat of cathexis was the solar plexus!
I just feel like bein' in love
Anything will do
A turtle or a turtle dove
Or maybe even you.

CLINT. Lewis Mumford says here that the troubles of urban society stem from the blind self-interest and hidebound ideologies of the various classes and interest groups.

Though it drives us, hurts us, wrecks us,
The seat of cathexis is the solar plexus!
I just feel like bein' in love,
Anything will do;
'Cause I just need a gentle shove
To fall in love with you.

(They kiss.)

CLINT. Gee. Tonight I could write the Bible, if you know what I mean.

SUE. Gee. Tonight I could eat ham and eggs, if you know what I mean.
BOTH. Gee.

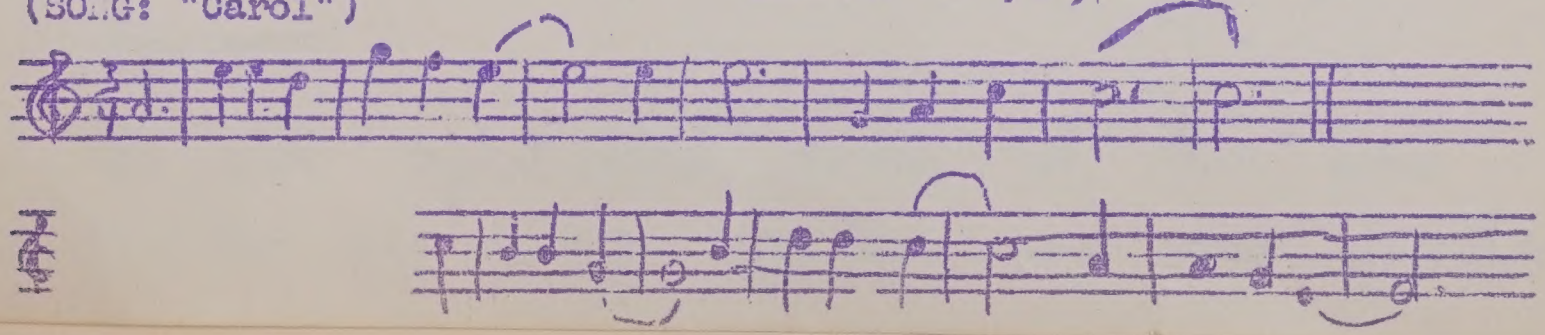
Scene Thirty-one. Peaches and Cream.

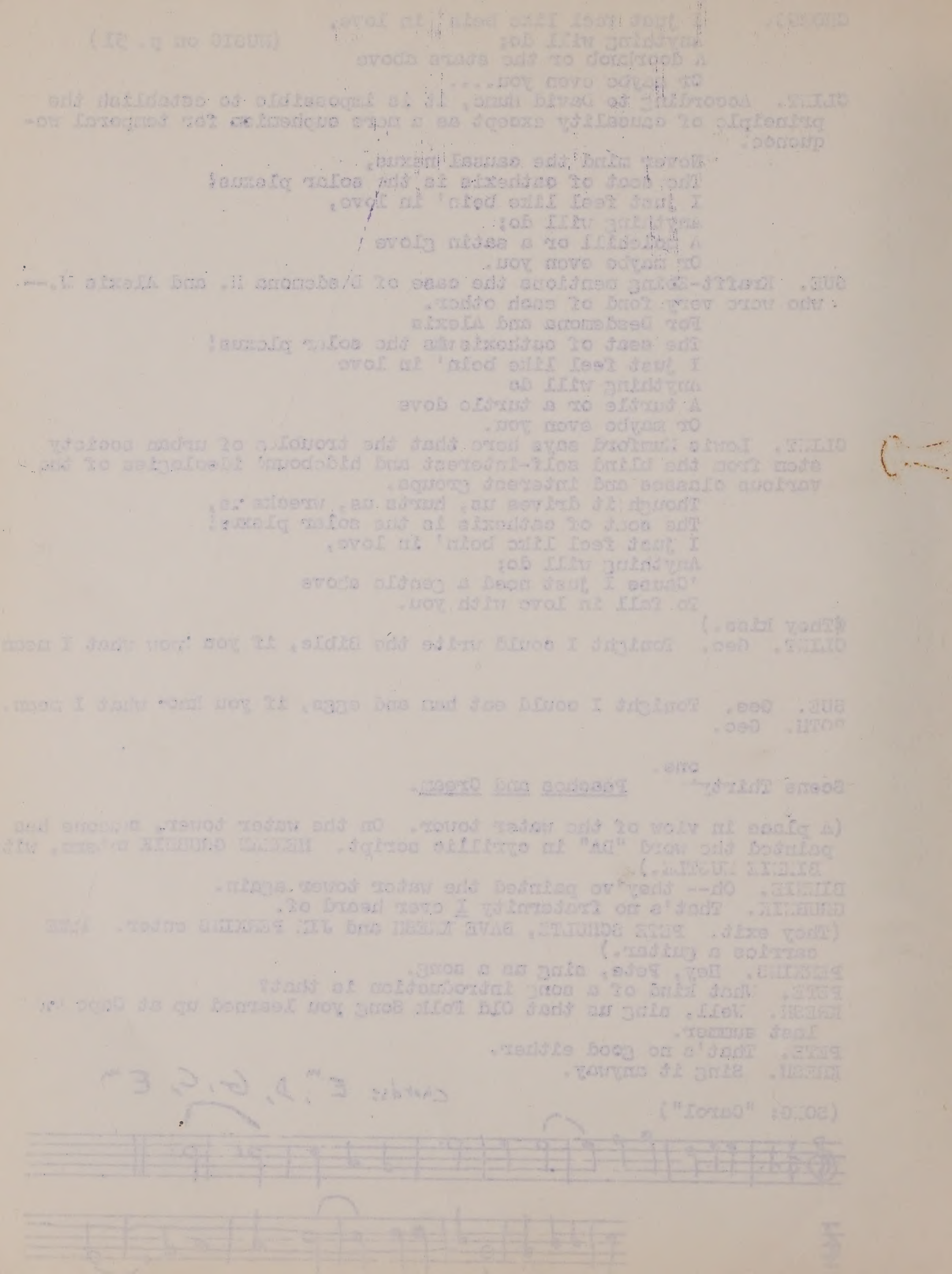
(A place in view of the water tower. On the water tower, someone has painted the word "DA" in cyrillic script. HERMAN GRUBNIK enters, with BINNIE MUSTLE.)

BINNIE. Oh-- they've painted the water tower again.
GRUBNIK. That's no fraternity I ever heard of.
(They exit. PETE SCHULTZ, DAVE KRESH and JIM PERKINS enter. PETE carries a guitar.)
PERKINS. Hey, Pete, sing us a song.
PETE. What kind of a song introduction is that?
KRESH. Well, sing us that Old Folk Song you learned up at Cape Cod last summer.
PETE. That's no good either.
KRESH. Sing it anyway.

(SONG: "Carol")

chords: Em, D, G, C, Em





PATENT OFFICE
cc: Rep. Jack ~~Brooks~~ Brooks
House Office Building
⋮
Washington, D.C.

~~Your honor: [MAF: check this greeting in dictionary]~~

I have read that you are soliciting comments on ~~your stand~~ the patenting of computer programs.

I believe that certain classes of computer programs ~~should be~~ should be patentable within the present intent of the patent law.

A misunderstanding may exist with regard to what computers do. What computers do is not necessarily

computers

One problem is the ~~computer~~ general misconception of what computers do. Computers, contrary to legend, are not mathematical (except in the far-fetched sense that ~~all board games are mathematical, and all languages~~ all board games, languages, ~~and road maps are "mathematical."~~ blueprints and organization charts are "mathematical."

~~It is~~

The more sophisticated version of this view is that computers only perform algorithms, and since algorithms

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Persons whose academic background is mathematical prefer to argue that ~~they are~~ all computer procedures are "really" of this type, but the resemblance is tenuous.

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Let me explain an example of what I would consider a computer programming ~~invention~~ technique of a patentable type: the list structure in Ivan Sutherland's "Sketchpad" graphical drawing system.

This invention the Sutherland ring list pertains to the storage of information needed to draw pictures, especially mechanical drawings or pictures made up of straight lines.

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Each type of information needed for some purpose — for instance, drawing a picture — ~~a picture is constructed, the positions of~~ corner points to draw a square is stored in blocks. Each block is a little list which can be placed anywhere in the computer's memory. For instance, the positions of corner points to draw a rectangle could be stored in a list four items long, or block. These blocks, ~~If does not matter where~~ the user may change the picture at any time, and the blocks will then be automatically rearranged to the changed picture. The machine is set up to rearrange these blocks according to the blocks are connected together by pointers, so that all the blocks having a given purpose may be found easily. This is done by pointers, which are like the address and return address on a letter. Each block carries the information of where certain other blocks are to be found. The pointers lead around in a circle, or ring, like beads on a necklace. each block has a pointer "clockwise" and "counterclockwise" directions. By looking at the pointers in successive blocks, the machine may "go around the ring" tells the address of its neighbor in the

and service different blocks in turn. It may also delete or insert new blocks, making the necklace longer or shorter.

One block is special. It is like the clasp on the necklace; it is a "parent" block, through which ~~the~~ ~~other parts of~~ the whole computer program finds and makes reference to the parts of this list. (In Sutherland's parlance, this is then "the" and the other blocks are the "chiefs.)

~~the importance~~

This invention is both very simple and very important.

~~there~~

I would like to make several points about this. The ~~one~~ most important is that Sutherland's ring structure is not mathematical, although it can be mathematically expressed. It is a process or art which is for the handling of information unique to the ~~world~~ world of digital computation. It is the sort of brilliant contribution to the world which will be kept under wraps if it is discovered within a company; the publicity of a patent, and subsequent licensing, would make ~~non-proprietary use possible~~ it possible for such techniques to be used instead of secretly hoarded, as they are now.

The techniques of list processing, like ~~this is only one area in which~~ Sutherland's, ~~above~~, are only one ~~aspect~~ area in which inventions occur that ~~are uniquely to~~ are uniquely in the area of digital computing, and neither fish, fowl nor mathematics by any prior criteria. Other important areas ~~where~~ such inventions occur, ~~if this happens, I would guess, include the writing of compilers systems~~, include compiler programming, graphical display (the original use of Sutherland's system), time-sharing and many others.

~~I have~~

Since I think it is self-evident that inventions like Sutherland's constitute patentable inventions in the legal sense, I have tried to figure out what ~~imp~~ distinctions exist between ~~processes~~ this type of process and the others. I have thought of several ~~candidates~~ possible distinctions for this purpose.

Let me enumerate these for your evaluation. 6

The intent is to distinguish such processes from mathematical ~~processes~~ procedures, on the one hand and ordinary bookkeeping procedures, on the other.

Distinction 1. ~~The~~ A process or technique should not be patentable if its purpose is to ascertain something which is ordinarily evaluated in mathematical terms, for example, where ~~the~~ this being evaluated ~~mathematical evaluation~~ is usually regarded as a mathematical entity itself, or usually regarded as a partial product in some other system. (For example, "square root" and "standard deviation," but not Sutherland's hens and chicks.)

X Distinction 2. A process or technique should not be patentable if it ~~involves~~ is principally composed of numerical evaluations as used in customary accounting or numerical procedures; especially, if the outcome is to be a set of numbers rather than some final product (such as ~~=~~ mtp).

Distinction 3. ~~Statute~~ An invention should not be patentable if it is concerned with areas where ~~matter~~ mathematical notation of any kind is customary. This would ~~seem~~ disallow statistics, ~~and~~ astronomy and optics, but favor picture-making, list processing and so on.

Distinction 4. ~~Does not involve an~~

* ~~An invention~~ program should be patentable if ~~its constituents~~ may be divided up into constituent parts that ~~are~~ have some important spatial relation, ~~and~~ has some important spatial analogy, or may be drawn on paper as a set of components in space, etc. ~~For instance,~~ If, like a tangible machine, ~~this~~ a computer program has parts which may be thought of as existing or moving in space, we are not dealing with a ~~machine~~ process so much as a machine which has been abstracted. (I understand this to be the intent of the "functional block" criterion in the Patent Office's guidelines.)

This distinction would go some way, I think, toward allowing such systems to Sutherland's file structure.